

## OUR BOOK SHELF

*The Gallery of Marianne North's Paintings of Plants and their Homes, Royal Gardens, Kew.* Descriptive Catalogue compiled by W. Botting Hemsley, A.L.S. Fourth Edition. Pp. 160. (London: Printed under the Superintendence of Her Majesty's Stationery Office, and sold at Kew Gardens, 1886.)

THIS is a much enlarged and improved edition of the previous excellent catalogue of these valuable and interesting paintings. The whole collection having been rearranged and as many as 220 additional paintings added, the value of the catalogue, as may be supposed, is considerably enhanced, and the more so as many of the new paintings are the result of Miss North's more recent travels in such noteworthy countries as the Seychelles. The description of each of the pictures, with notes on the habits and uses of the plants represented, are both interesting and useful, the whole being carefully condensed within reasonable compass, but beyond this the present edition is made doubly useful by the addition of a most carefully drawn up list of plants referred to in the catalogue, arranged alphabetically under their natural orders, together with the native country of each species. The sketch of the "general features of the vegetation of the countries visited" is a most valuable addition, each country being treated of separately. These are, as Mr. Hemsley says, "short paragraphs describing the prominent features and peculiarities of the vegetation of the various countries whose floras are illustrated with some degree of fulness therein." Thus, under Chili we have first a general description of its position, character, climate, and meteorological conditions, followed by notes on the vegetation, with references to the more important genera. This part of the book, which forms the introduction, and extends to thirty-one pages, will be extremely useful to all students of geographical botany; indeed the whole book has a value besides that of a mere "guide" to the visitor to the gallery.

We cannot conclude our brief notice of this excellent catalogue without referring to another important feature in this edition, namely, the introduction of a really good map of the world, showing in red the countries visited by Miss North, and in green other floras partially illustrated in the collection.

## LETTERS TO THE EDITOR

- [The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]
- [The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.]

## The Thomson Effect

It affords me much satisfaction to find that my statement of the facts of the Thomson effect is in the main accepted by Prof. Tait. The errors to which I called attention had been copied into at least one recent electrical text-book, and were in a fair way to obtain general recognition as fundamental principles.

The only objection which Prof. Tait raises to my statement is my omission to include a correction for the variability of one of the coefficients with temperature. This is no valid objection, as the limits of space forbade me to encumber my explanation with any unnecessary detail, and my mathematical investigation was avowedly only approximate. The correction thus supplied by Prof. Tait and embodied in his equation (1) is to the effect that, in flowing through a copper conductor, the electric current, while displacing the whole temperature curve in the forward direction (as stated by me), displaces the maxima more than the minima, so as to make the descending gradients steeper and the ascending gradients less steep, the displacement of each point being proportional to its absolute temperature. In iron the same

rule holds except that "backward" must be substituted for "forward." Prof. Tait agrees with me that the ordinates are not increased or diminished, but are simply shifted. The current does not tend to diminish the difference between maxima and minima, as a real fluid would do.

The phrases "electric convection of heat" and "specific heat of electricity" have served their purpose, as provisional terms, furnishing a short and easily-remembered way of expressing certain new facts, which would have required for their full expression a long periphrasis; but to retain them any longer in our text-books is to place a needless stumbling-block in the way of teachers and students.

Let Thomson's coefficient  $\sigma$  (hitherto called the specific heat of electricity) be called the *Thomson coefficient*, and let the numbers tabulated by Prof. Tait under the heading "Specific Heat of Electricity" ("Heat," p. 180) be called *tangents of slope*, a name which speaks for itself when the meaning of a thermo-electric diagram is understood. The Thomson coefficient will thus (in the ordinary case) be equal to the absolute temperature multiplied by the tangent of the slope; and the amount of the Thomson effect between two given temperatures will be their difference multiplied by the Thomson coefficient for the mean temperature.

A good name is wanted for the ordinate of any point in a thermo-electric diagram. In the first edition of "Units and Physical Constants," being driven to give it some name, and not being able to think of a good one, I employed the makeshift term, "thermo-electric value." In the forthcoming edition I propose to denote it by the more appropriate name, "thermo-electric height."

J. D. EVERETT

Belfast, June 12

## Black Rain

THE heaviest shower on record fell yesterday afternoon between 6 and 7 p.m. It began at 6.36, and almost six-tenths of an inch fell in the first quarter of an hour. The wind was shifting rapidly at the time from north through west to south. The water collected was very dark, but not so black as that which fell on April 26, 1884.

S. J. PERRY

Stonyhurst Observatory, June 10

## Meteor

YESTERDAY (Sunday), June 13, at 10.12 p.m., looking eastward, I saw a magnificent meteor, extremely brilliant, darting from southward to northward, at an altitude of about 30°. It must have been a minute or two in view, as I had time to stop walking and watch it describe a long track. When it had passed the prime vertical it burst into a shower of sparks which, falling in a second or two, became invisible. The colour of the meteor was intense white, with a bluish tinge in rear, and only a very slight trail was visible. On exploding the light was crimson for an instant, and the sparks were red.

Should you receive any other notices of this meteor, its height, distance, and magnitude may be computed. It seemed to me of the diameter of a cricket-ball. I have never seen so large a meteor before, or any describe so long a path. The memorable meteor-shower of 1866 (?) exhibited none so large, though possibly many had longer tracks. You may hear of it from the North Sea.

R. STRACHAN

11, Offord Road, London, N., June 14

## "Arithmetic for Schools"

MR. LOCK is a little loose, not to say unfair, in the drawing of his inferences; I prefer, therefore, to stand by my own words.

(1) When I said "the purely arithmetical part" (not Part) of the book, I meant what I said, viz. those sections where such *theoretical* matters as the finding of the highest common factor, the extraction of the square root, &c., are treated of. The possibility of any reader of NATURE drawing the inference which Mr. Lock succeeds in drawing, viz. that the book is expressly divided into Pure Arithmetic and Practical Arithmetic, is surely a very trivial matter.

(2) At p. 181 the following definition occurs:—"Rate of interest is the ratio of interest to the principal." This I gave as an instance of "slight inaccuracy." It may be a fundamental misconception, and not a slight inaccuracy; but if so Mr. Lock

has no cause for complaint. He ought to know that interest is a function of two variables.

(3) In reply to Mr. Lock's request for other slight inaccuracies I might ask, without leaving the subject of interest, what under the sun "inverse interest" is: but though inaccuracies of language are not desirable in a school-book, I prefer to draw his attention to more important matters. Every arithmetician knows that the practical questions which come under such headings as Simple and Compound Interest, Exchange, Discount, Stocks, &c., are not questions of a different kind *arithmetically*, being all so-called "proportion" questions, and that no more important fact can be taught to the student of arithmetic regarding them. Now here is Mr. Lock's treatment. Simple and compound proportion questions are put under the headings "Problems" and "Complex Problems"—names, by the way, quite illogically chosen and not consistently adhered to. Exchange is tacked on to Complex Problems by the words, "examples in Exchange can be worked by the above method"—indeed, these words and a worked example constitute the sum total of information given in the book on this subject. No one could object to the union here indicated, but surely the same is equally true of several of the other subjects. After Exchange comes a section headed "On Problems concerning Time: I., Time and Distance." These are not problems in the sense previously specified, but belong to the genus of examination questions which concern bodies moving in the same path with different speeds. A like remark applies to the section which follows, headed "II., Time and Work." Late in the day, after Interest, Discount, &c., there appears a chapter "On the Use of the Term *Per Cent.*" So far as it is on anything (for it consists of seven or eight lines of introduction, three worked and forty-five unworked examples), it is on the calculation of rates of gain and loss. Now all this, one is bound to affirm, is strangely illogical, and tends to give a most erroneous conception of arithmetic as applied to practical affairs. I used the expression "slight inaccuracies of thought" in referring to such a mode of treatment, because it was impossible to be more severe without going into detail, and because it seemed imperative to say something against a practice, which our examination system fosters, of forming text-books by collecting all the kinds of exercises met with in examination papers and separating them into carelessly ticketed groups prefaced by a definition or two. The purely arithmetical, and larger, part of Mr. Lock's book is not of this character, and is, especially as regards the definitions, very carefully prepared; he would considerably enhance the value of the whole by wisely modifying the rest in the second edition.

THE REVIEWER

I THANK you for your courtesy in permitting me to see the reply of your reviewer to my letter which appeared in NATURE of June 3 (p. 100). That my letter was written under very exceptional circumstances will be clear to any one who will take the trouble of comparing your reviewer's defence of his criticism with the book itself. I will, however, with your permission, make one or two comments on his reply.

(1) That a wrong inference was suggested by the words of the reviewer is, no doubt, of little consequence, except that it afforded me a ground for an appeal to you for further information.

(2) Your reviewer did not quote in his review, as he now does, my definition of rate of interest; he asked whether rate of interest is totally independent of the time, implying that I stated that it was so, and ignoring the fact that the manner in which time is involved in Interest (not in *rate* of interest, on which point your reviewer seems a little confused) is gradually explained in the next few pages. Might I ask your reviewer whether in Compound Interest the Interest varies simply as the Time?

(3) In his third paragraph your reviewer gives his answer to my request that he should quote *verbatim* the other instances on which he based his unfavourable criticism. There is little or nothing here for me to answer, except that I am compelled, in justice to myself, to point out the reviewer's own mistakes. (i.) He suggests that Exchange ought logically to be placed between Compound Interest and Discount. It would seem necessary to remind him that in questions on Exchange there is no reference to *time*, and that it is the peculiar manner in which time is involved, which distinguishes Interest and Discount from other Problems involving money. (ii.) He states that questions

which I have called "Problems concerning Time" are improperly so-called. It will be clear to any one who reads the chapter on "Problems" that a Problem is a question on Variation; so that problems concerning time are exactly what their name indicates. But (even supposing your reviewer were right on these two points) in charging me with being strangely illogical as regards the order of my chapters, he must have overlooked the fact that in the preface I expressly state that "novelty in arrangement has been avoided as much as possible," but that "the order in which his chapters are taken may be varied at the discretion of the teacher." For my part I think that the established order of subjects is not to be lightly upset, certainly not without more sound and weighty reasons than those adduced by your reviewer.

But besides this your reviewer draws an unfair inference, due I suppose, to mere carelessness. The words "Inverse Interest" appear only as the heading of pp. 187, 188, and are obviously an abbreviation for convenience of printing of the words on p. 186, "Inverse questions on Interest." As far, however, as I can understand the general effect of your reviewer's explanation, his objection to my book seems to be this—that it fails to bring into sufficient prominence the fact that the Practical Applications of Arithmetic (which, in accordance with established custom, I have collected under the heads of Exchange, Problems concerning Time, Interest, Proportional Part, &c.), really present the same idea under different circumstances, expressed in different language. I entirely agree with him as to the importance of this fact, and endeavoured, as far as the scope and object of my book would allow, to give it due prominence. For example, for this reason, it seemed unnecessary in Exchange and in the chapter on Profit and Loss to give more than a few words of explanation in addition to the examples worked out.

JOHN B. LOCK

Gonville and Caius College, June 14

#### PASTEUR'S RESEARCHES

IN the current number of the Royal Agricultural Society's *Journal* (vol. xxi. part 1) is a full and able account of the work of the great French experimenter from an agricultural and veterinary point of view, by Dr. George Fleming. The development of Pasteur's genius is traced from his early chemical researches on dextro- and levo-tartrates to fermentations in milk and in malt. The combination of microscopic with chemical modes of investigation led him to the definite determination of the part played by living organisms in acetic, butyric, and alcoholic fermentations. In these inquiries his own labours were almost entirely original, but it must not be forgotten that a few microscopists in England and many in Germany were working on the same lines, and contributed to the establishment of the modern doctrine that fermentation and putrefaction are both processes dependent on the presence and growth of minute parasitic plants. Pasteur's experimental investigations led him in two directions—in one to the establishment of the now accepted theory of biogenesis: that every living thing is the product of a living parent; in the other to the practical application of the facts ascertained to the manufacture of vinegar and the process of brewing.

Ingenuity in devising experiments and patience in carrying them to a successful issue belong more or less to every successful investigator, but the union in addition of clear theoretical conceptions with skill in the useful application of results is characteristic of Pasteur as it was of Faraday and a few other of the highest intellects.

His investigation into the cause of *pébrine*, or silkworm disease, was undertaken against his will, in deference to the urgency of the eminent chemist Dumas. Pasteur wished to return to his original department of chemistry, and it is remarkable that having once left it he has been drawn further and further into biological researches, while Dumas, who began with valuable work on the development of the ovum, was diverted to chemistry and there made his enduring reputation. Perhaps no instance more remarkable than Pasteur's work on the *pébrine* can